

# The power of the network effect on TSMC's VCA ecosystem – An imec perspective

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**TSMC 2017  
Open Innovation Platform<sup>®</sup>  
Ecosystem Forum**



# ABSTRACT

As a Value Chain Aggregator (VCA), the IC-link division of imec connects innovators and entrepreneurs to the right TSMC technology to turn their ideas into reality. By performing over 500 IC tape-outs per year and working with an established network of over 300 companies and 700 universities, we have a unique perspective on the technological, business and market trends occurring within our industry. This presentation will show the results of an internal program to access and explore this unique database, which we feel performs the role of a leading technology indicator. As an example, an analysis of internal invoicing data has allowed us to form a connectivity graph of our business ecosystem. These data graphically display the role that a VCA plays in connecting customers to technology service providers (which in addition to TSMC as a foundry service provider, include wafer thinning, packaging, failure analysis, test and qualification service providers). Our analysis shows that within the imec business ecosystem, each customer may be connected to every other customer by, on average, just three “hops” across this network. This tight network coupling is critical for the continued development of innovation as it permits efficient sharing of knowledge and project management skills across the network.

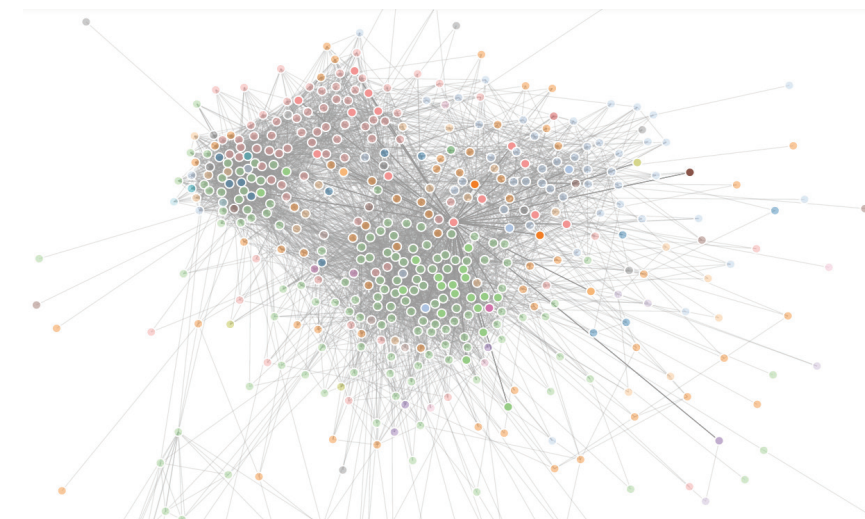


THE POWER OF THE NETWORK EFFECT ON  
TSMC'S VCA ECOSYSTEM –  
AN IMEC PERSPECTIVE

PHILL CHRISTIE  
PROGRAM DIRECTOR IMEC

SOCIAL NETWORK

LinkedIn

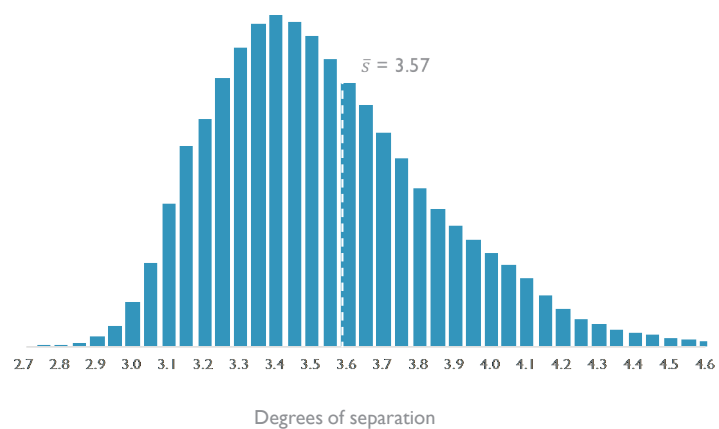


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DEGREES OF SEPARATION

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- 2011:  $\bar{s}=3.74$
- 2016:  $\bar{s}=3.57$

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## Dictionary

network effect



## network effect

**noun** ECONOMICS

a phenomenon whereby a product or service gains additional value as more people use it.  
"instant messaging is a market with strong network effects"

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## Dictionary

critical mass



## critical mass

**noun**

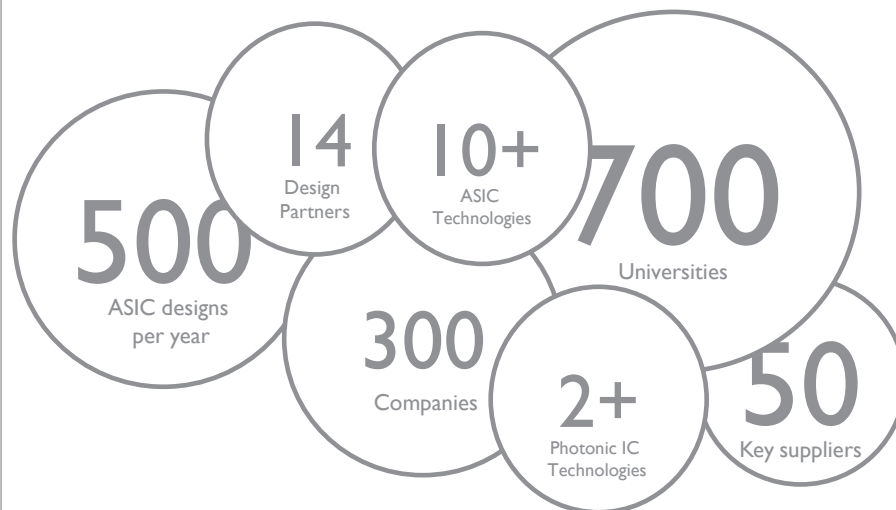
1. PHYSICS

the minimum amount of fissile material needed to maintain a nuclear chain reaction.

2. the minimum size or amount of resources required to start or maintain a venture.

"some of our new industries are now reaching critical mass"

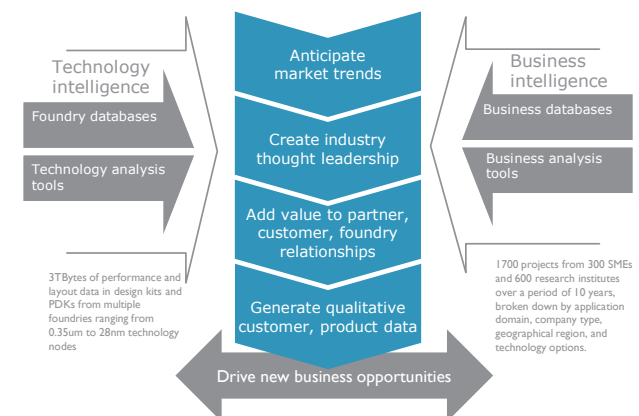
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imec VCA business model focusses on numbers

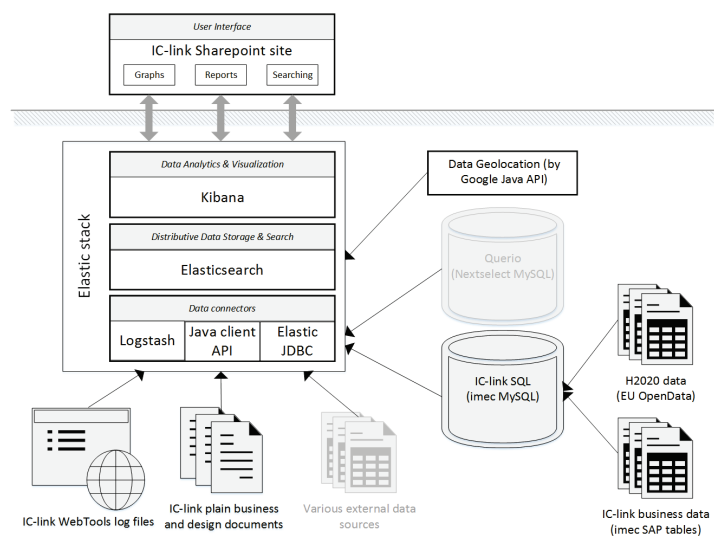
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## BUSINESS & TECHNOLOGY ANALYTICS PROGRAM

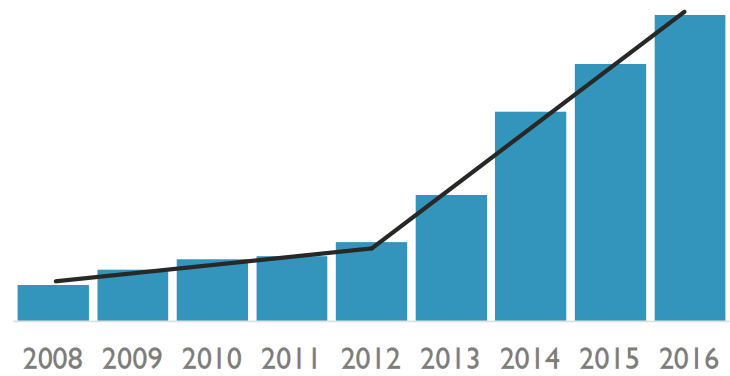


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ANALYSIS INFRASTRUCTURE

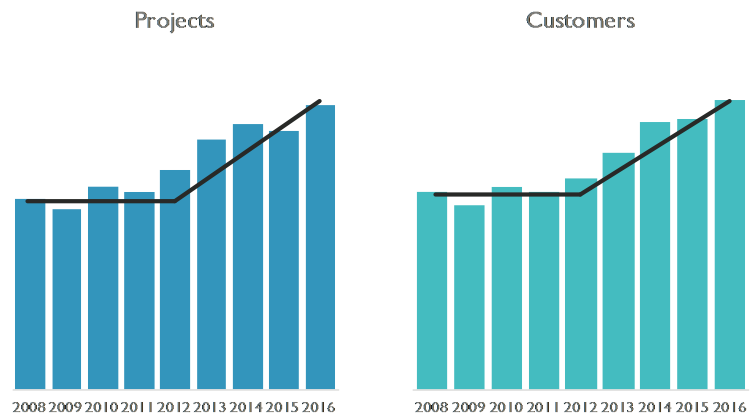


TSMC CYBERSHUTTLES

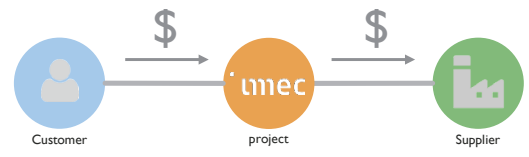


Quantitative change in business in 2012

GROWTH IN TSMC-RELATED PROJECTS AND CUSTOMERS



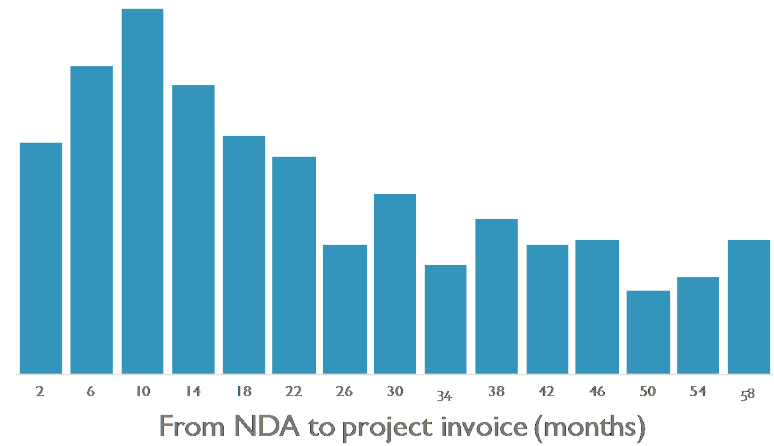
Quantitative change in business in 2012



Connection matches customer and supplier SAP invoice to a common project

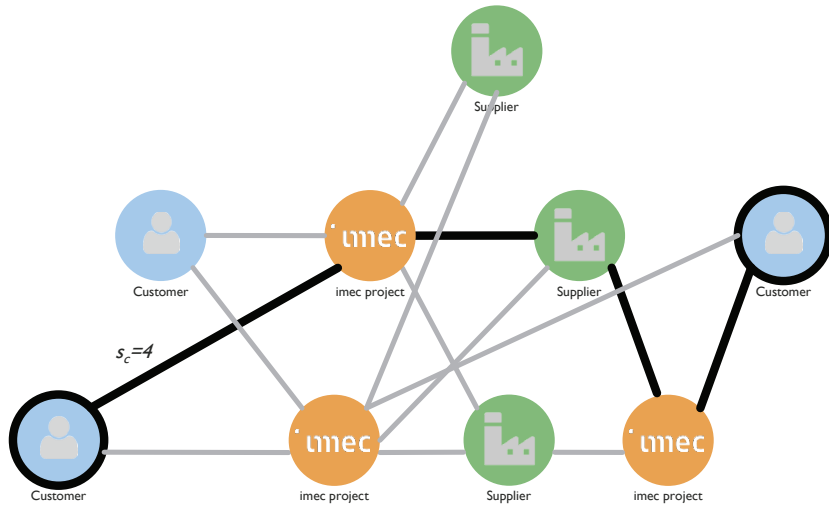
## GENERATION AND DECAY OF CONNECTIONS OVER TIME

FUSION OF NDA AND SAP INVOICE DATABASES



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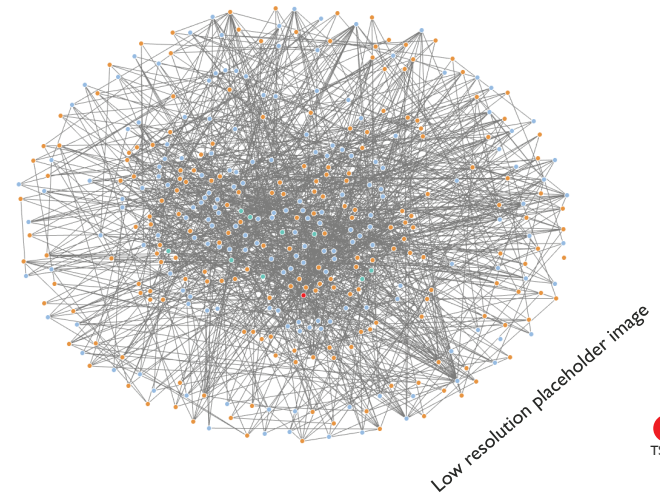
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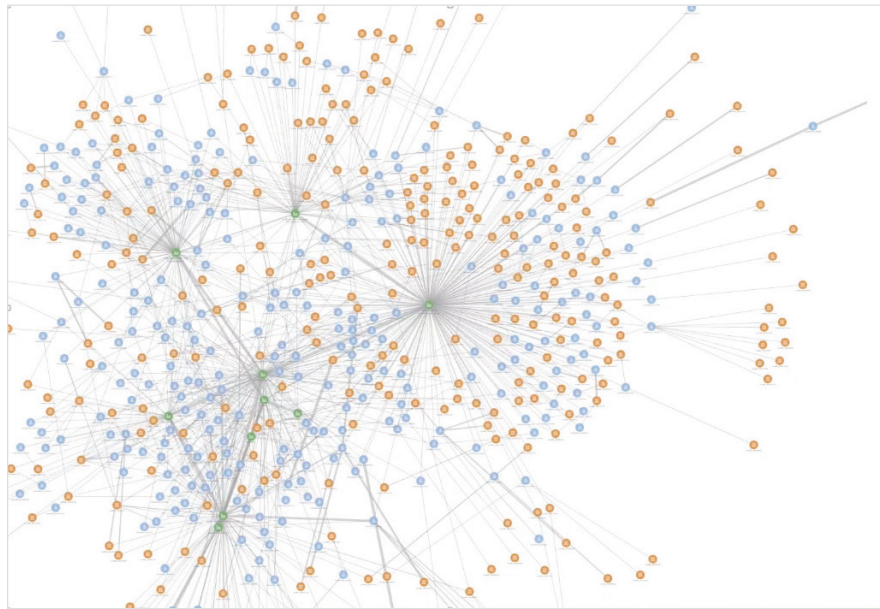
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2008  
390 NODES, 465 CONNECTIONS,  $\bar{s}_c=4.6$



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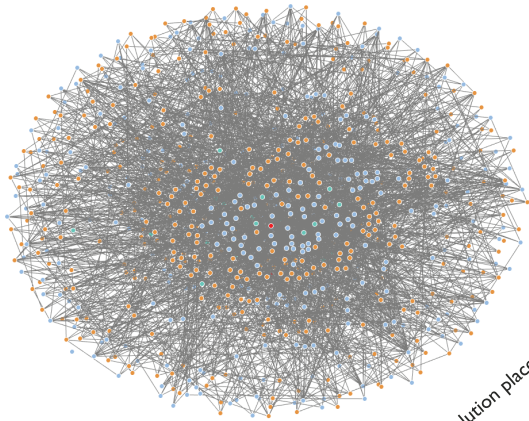
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2012

433 NODES, 467 CONNECTIONS,  $\bar{s}_c=4.8$



Low resolution placeholder image

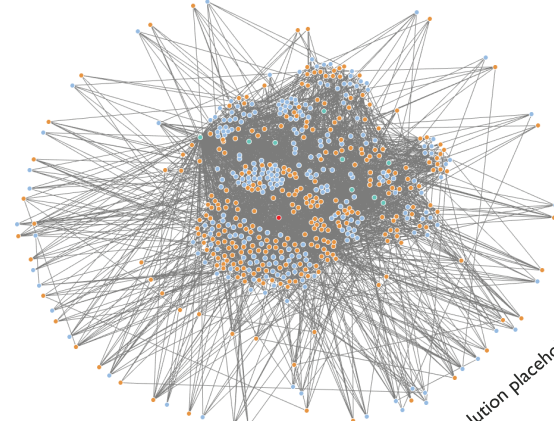


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2016

573 NODES, 1190 CONNECTIONS,  $\bar{s}_c=2.9$



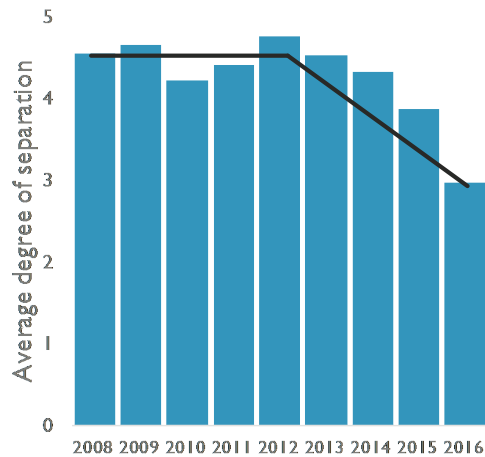
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## DEGREES OF SEPARATION



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## ANALYZING THE VCA BUSINESS ECOSYSTEM

### Analytics Program

Understand and guide our VCA business through data analysis and visualization

Strong case for network critical mass around 2012

### Critical mass

### Business Networks

The evolution of the VCA ecosystem is best understood through social-business network metrics

Observe lowering of degrees of separation in VCA network after 2012

### Network metrics

### The NETWORK EFFECT

Lowering of average degrees of freedom correlates with increases in financial business metrics since 2012

A more tightly coupled network benefits customers due to better knowledge sharing and support

This generates powerful positive feedback

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